

HISTORY AND DEVELOPMENT
OF THE
CENTRAL HEATING PLANT
AT THE
UNIVERSITY OF MARYLAND
COLLEGE PARK
MARYLAND

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PRESENTED
AS AN
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BETA CHAPTER OF MARYLAND
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HISTORY AND DEVELOPMENT OF THE CENTRAL HEATING PLANT

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SUMMARY

The first central heating plant at the University of Maryland was constructed in 1895 by Admiral John D. Ford. This original plant, with subsequent alterations, additions and repairs, was in constant service until the fall of 1931. In this year a modern, efficient, and up to date central heating plant was put into service, thus relegating the old plant to the scrap heap. The new plant with a total capacity of 800 B.H.P. now serves the entire campus with steam heat.



1895



1933

THE HISTORY AND DEVELOPMENT OF THE CENTRAL HEATING PLANT

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INTRODUCTION

The first central heating plant at the Maryland Agricultural College was constructed at a time when the school was struggling for its very existence.

Very little thought was given to the keeping of permanent records regarding campus developments, improvements, and expenditures, consequently, information dealing with the origin and development of the plant is very limited or totally lacking. Most of the few records that were made were lost in the fire which subsequently destroyed the administration building, thus leaving little in the way of actual facts on which to base an early history of the plant.



Fig. 1. Original Plant.
Constructed in
1895.

ORIGIN AND EARLY DEVELOPMENT OF THE FIRST PLANT

In 1895 the first central heating plant (Fig. 1.) was constructed in the rear of the engineering building by Admiral John D. Ford, who later served under Admiral Dewey at Manila bay.

This plant furnished steam to the engineering building and thru a 3" low pressure line to one or two other nearby buildings, thus making it a "central heating plant" in the true sense of the word. The original equipment probably consisted of the two boilers A and B (Fig. 6) and a few auxiliaries. These boilers, which are still standing, were made by the Crook Horner Co. of Baltimore. They were of the fire tube type and had a capacity of about 100 B.H.P. at a boiler pressure of 90 pounds.

In 1904, two Bullock, D.C. generators and two Racine steam engines

(Fig. 3.) were installed in the plant. These generators were of 20 K.W. capacity, operated at a speed of 375 R.P.M. and furnished all current used on the campus from 1904 to 1912. The Racine "Automatic Engines" were direct connected to the generators and were double acting machines developing about 30 H.P. with supply steam at 90 pounds gage.



Fig. 2. One of the Two Original Crook Horner Boilers. (Fire Tube.)

The legislature of the state of Maryland granted "6000 dollars for repairs to boilers" to the Maryland Agricultural College in 1906. Much of this sum probably was used for repairs on individual boilers in certain of the other buildings, thus giving us little knowledge of the amount spent on the central plant. In 1908



Fig. 3. One of the Two Bull-ock Generator Sets. Each of 20 K.W. Rating and Operating at 375 R.P.M. Installed in 1904.

the construction of the infirmary, gymnasium (Now old library), and chemistry building (Now home economics building), put an additional load on the plant which supplied heat to these buildings through a 3" low pressure line. It is probable that at this time a boiler was installed in the position C (Fig. 6). This boiler was an Erie City, fire tube job, developing 100 B.H.P. at 90 pounds gage. A legislative grant of 16000 dollars was given to the school in 1910 for "deficiency in the heating plant".

An additional 10,000 dollars was

requested but was disallowed by the Governor. No record was made as to the nature of the "deficiency" although it was probably due to the purchase and installation of additional auxiliary boiler equipment.

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LATER DEVELOPMENTS AND ALTERATIONS

The construction of Calvert Hall in 1914 necessitated the laying of a line (Fig. 4) from the engineering building to the dormitory. This line was laid in a ditch about four feet deep by four feet wide. In addition to the 6" high pressure steam main and $2\frac{1}{2}$ " return, (Fig. 5) the water mains were also included in the same ditch.

Detail sketches of this line, Fig. 5, show the type of equipment that was installed during this period.

Silvester Hall, upon it's completion in 1921 took steam from this same line thus putting an additional load on the plant and making further plant alterations necessary.

The most important change made in 1922 was the installation of one 150 H.P., Erie City fire tube boiler, operating at 90 pounds gage, shown in Fig. 6 as boiler "D". At this time

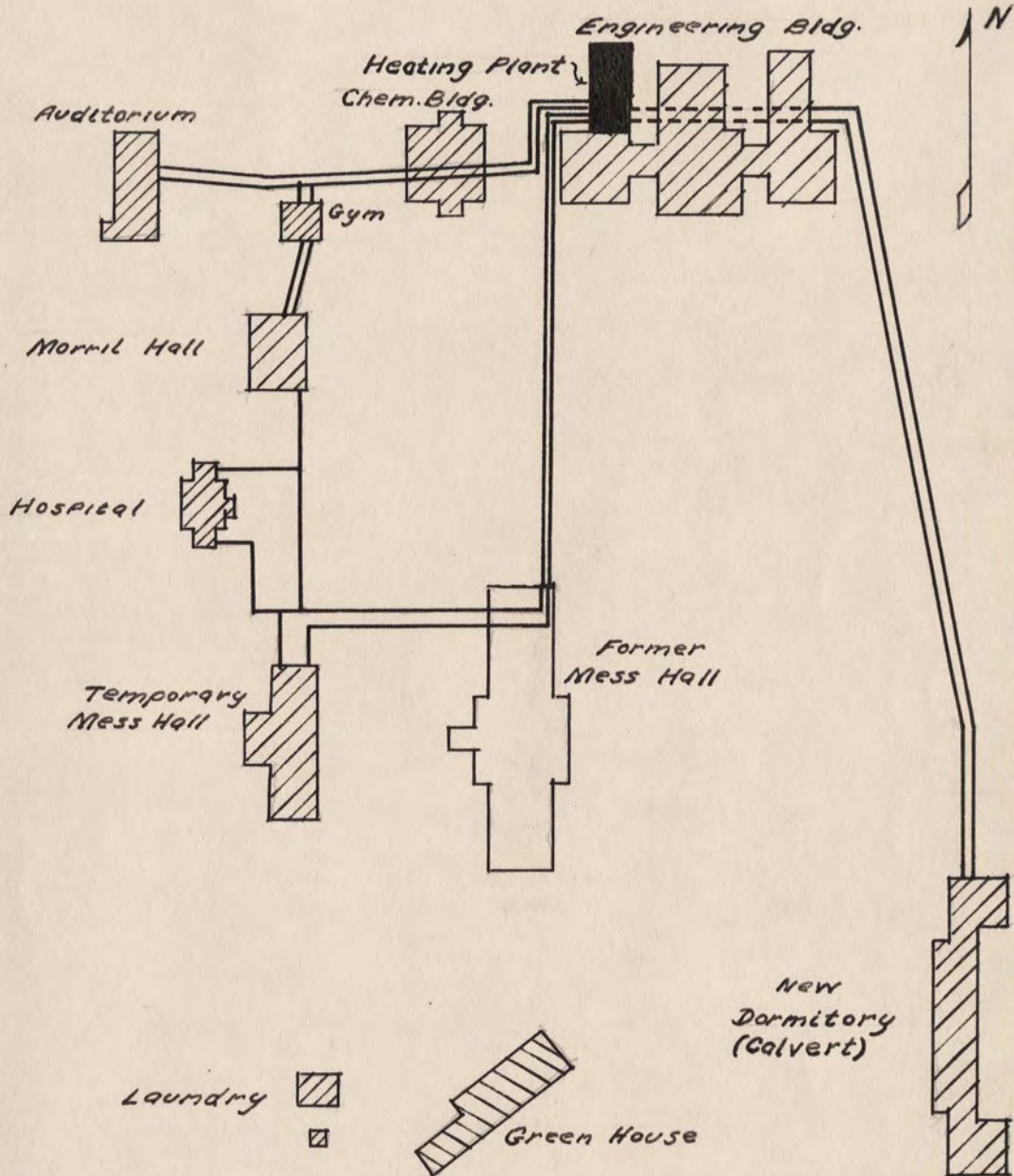


Fig. 7. Cameron and Worthington Boiler Feed Pumps. Working Pressure 90 lb.

the coal bunker was placed outside the plant so as to give more floor space in the boiler room. The Cameron and Worthington boiler feed pumps (Fig. 7) were moved to the locations E and F, (Fig. 6). The feed H_2O heater G and the vacuum pump H were moved to the locations shown.

The completion of the present dining hall made necessary the installation, in 1924, of a 6" high pressure line to supplement the 3" low pressure line which had been used for the temporary dining hall. At this time the 6" high pressure line to the new chemistry building was installed. These added loads required the installation

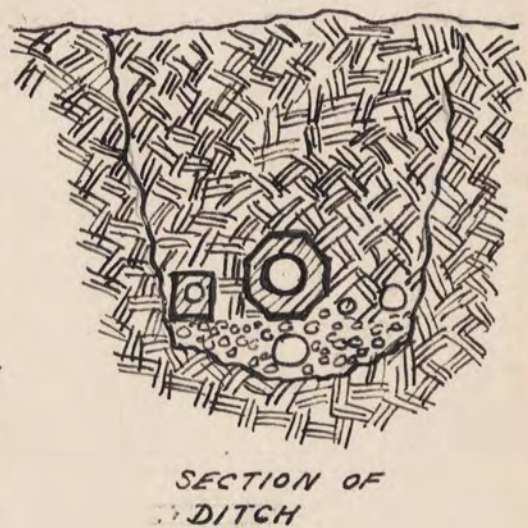
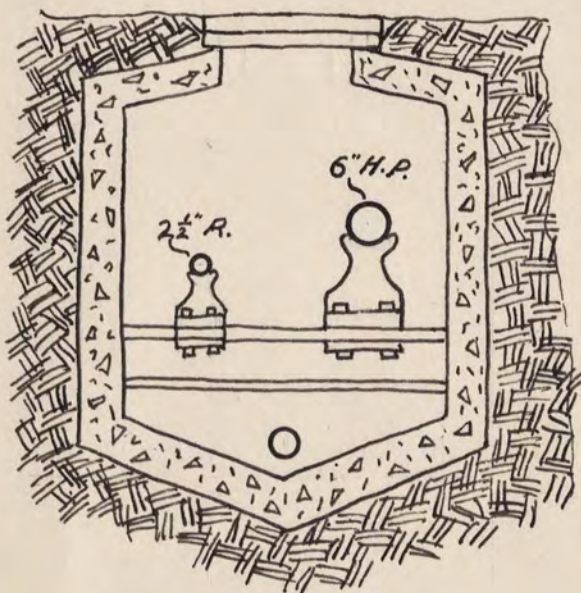
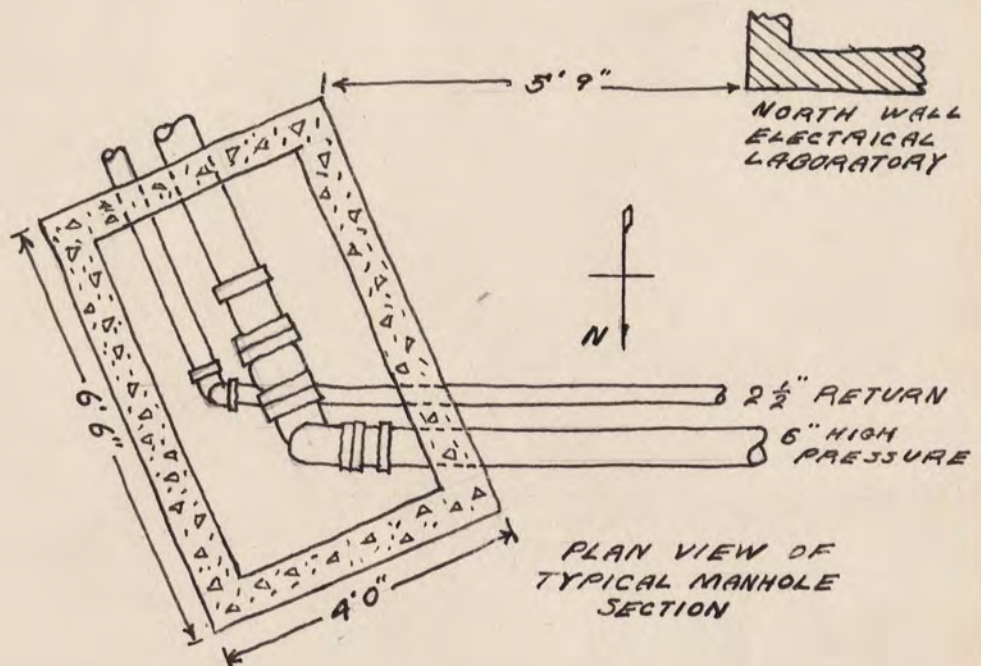
STEAM LINES
OF
MARYLAND AGRICULTURAL
COLLEGE
APPROXIMATE DATE 1914



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Fig. 4.

DETAIL SKETCHES OF DORMITORY LINE LAID IN 1914



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Fig. 5.

PLAN OF POWER PLANT
AFTER
ALTERATIONS OF 1921

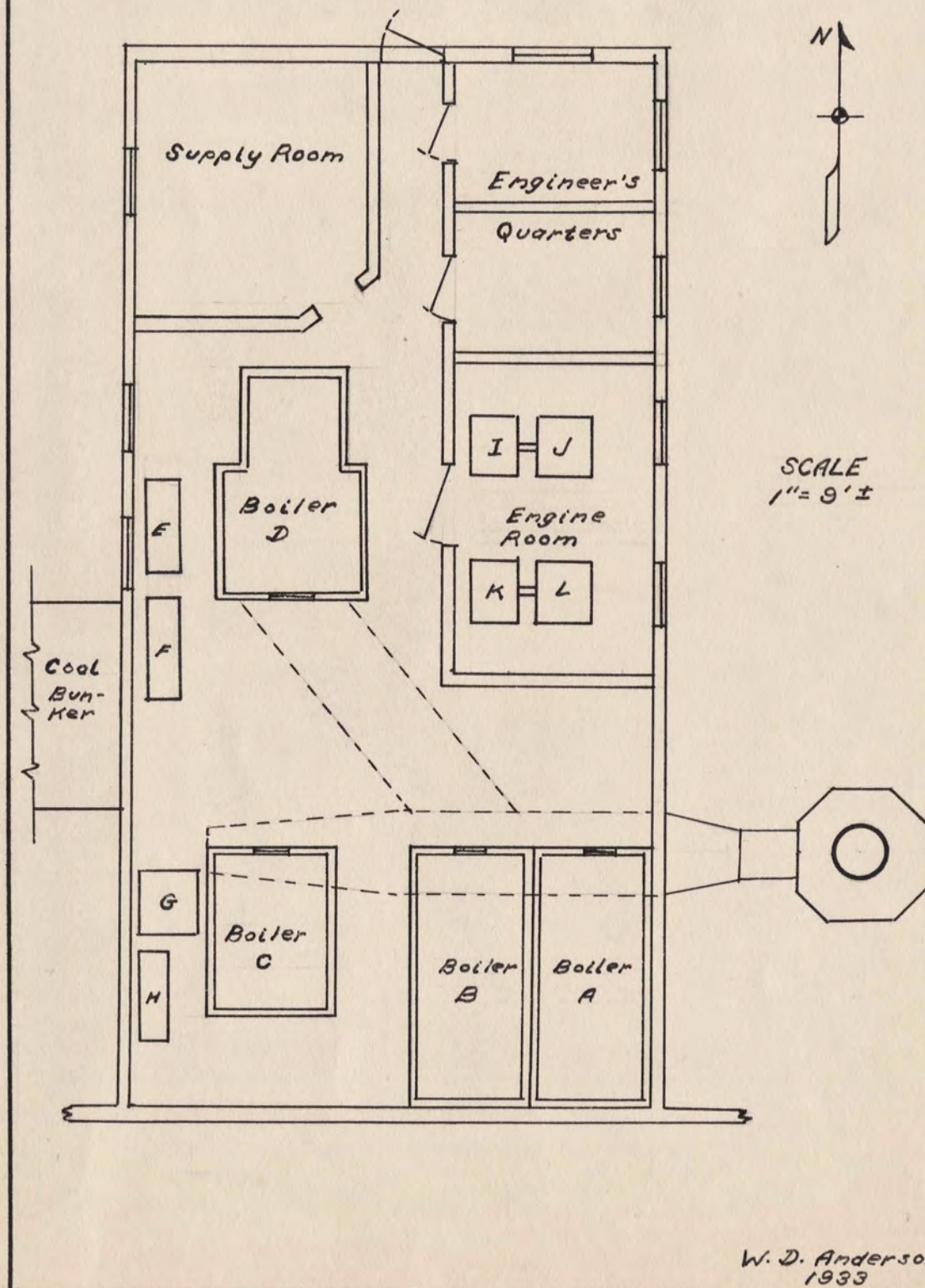


Fig. 6.

of an additional boiler. One 150 B.H.P. Erie City fire tube boiler, (Fig. 8) was placed as shown (C in Fig. 6) thus using the old foundations of the 100 H.P. Erie City boiler which was removed and scrapped.

Further building developments on the campus made necessary the installation of 6" high pressure lines paralleling the old 3" low pressure lines so that by 1927 nearly all of the old lines had

been supplemented by new 6" lines.



Fig. 8. Erie City 150 H.P.
Fire Tube Boiler, Installed
in 1924.

No major alterations or additions were made to the old plant after the boiler installation of 1924. The maximum capacity of the plant before it was abandoned in 1931 was between 400 and 500 B.H.P., probably closer to the lower figure as the equipment was in rather a poor state of repair. Since neither the coal nor the water was measured or weighed there are no figures available which would give an indication of boiler or plant efficiency.

ORIGIN OF THE PRESENT PLANT

The intensive building program which was started by the University about 1927 was the primary reason for building a new central heating plant. The advantages of a central plant system as to economy, safety, cleanliness, etc. were additional factors in

deciding on this type of heating equipment. Some of the other plans proposed were, a gas producing plant with gas piping to the various points on the campus, and a steam plant with oil burning equipment instead of coal burning furnaces. A conventional steam heating plant using coal as a fuel was finally decided to be the most satisfactory.

In 1929 the state legislature of Maryland granted the University 200,000 dollars for the new proposed central heating plant. H. Egli, of Baltimore was retained as the consulting engineer for the project. He drew up the plans and specifications and supervised the building of the plant. Work was started on the plant in 1929. In 1931 an additional legislative grant of 12, 650 dollars was received for completion of the plant, and the plant (Fig. 9) was put into service in the fall of 1931.

PLANT EQUIPMENT

The boilers are of Babcock Wilcox make, and each of the two boilers installed is built to develop 410 B.H.P. at a pressure of 160 pounds gage. In this installation the pressure is kept around 100 pounds gage. Each boiler has a heating surface of 4114 square feet, and a radiation surface of 57,500 square feet.

Forced draft is furnished to the boilers by two complete turbine driven blowers, made by the Buffalo Forge Co. The air ducts



Fig. 9. The Present Plant. Completed in 1931.

from each blower communicate with only one firebox, thus making it possible to control the draft to each furnace within narrow limits.

Coal is delivered to the plant in trucks, dumped over a grating ($2\frac{1}{4}" \times 4"$) into the bucket of the skip hoist. The skip hoist (Fig 11) then elevates the bucket automatically by means of a Cutler-Hammer magnetic switch board and dumps the coal into the coal bunker, (Fig. 12.) The coal feeds by gravity from the bunker down into the weigh larry. Here the coal is weighed and then dumped into the stoker hoppers.

The Taylor stokers are multiple retort, underfeed machines driven by individual Troy stoker engines, type VT0, size $4\frac{1}{4}" \times 5"$, (Fig. 13.). Both the stokers and blowers are controlled

by a Mason regulator. This type of regulator is actuated by variations in boiler pressure of only a few pounds, thus giving us very close control. Also, the Mason regulator, (Fig. 14) makes it possible to run the plant with a smaller crew and consequent saving in maintenance.

Since the condensate from the radiators of the system is not returned to the boiler, fresh water from the mains is constantly entering the plant, thus requiring the use of a preheater to warm the feed water. From the preheater the water goes thru the flow meter which is of the Cochrane V notch type. This meter has a recording dial which shows the water consumption curve drawn on a time scale. The water which has been heated from about 40 to 110 degrees F.

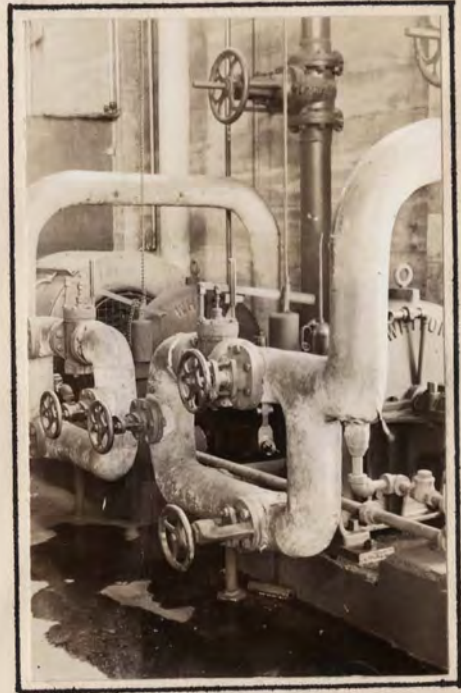


Fig. 10. Whiton Turbines and Buffalo Forge Co. Blowers.

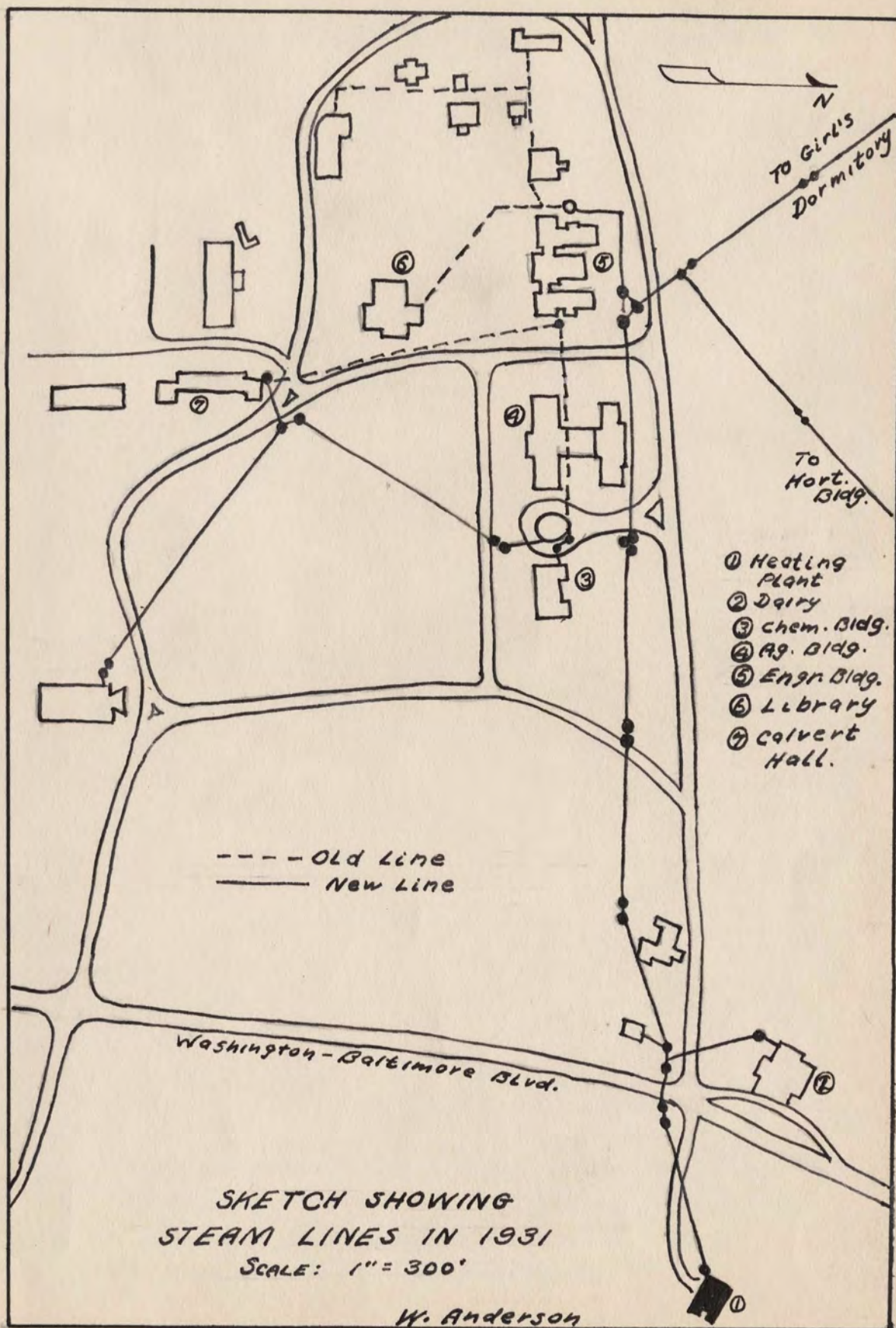




Fig. 11. Beaumont Skip
Hoist, Cutler-Hammer
Control.



Fig. 12. Coal Bunker
Capacity - 100 T.

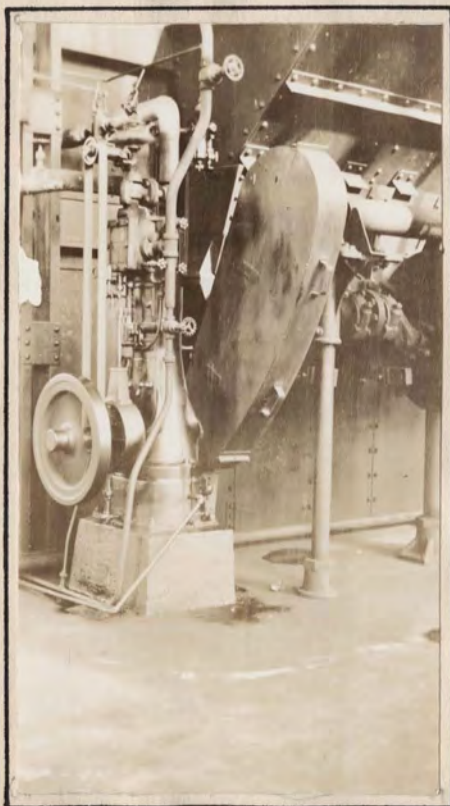


Fig. 13. Troy Stoker Engine.
Type VT0, Size, $4\frac{1}{4}$ " X 5".



Fig. 14. Mason Press-
ure Regulator.

now goes to the feed water heater where it is heated to about 180 degrees F. Leaving the heater the water enters the boiler feed pump (Fig. 15) and is discharged at a pressure of about 140 pounds gage. The discharge side of the feed pump is tapped and connected to a Copes automatic pressure control which varies the speed of the pump to suit the load.

Figure 16 shows the instrument panel for the draft gauges and CO₂ meter. The draft gauges give the amount of vacuum, about .2" above the grate and the pressure, about 3" water, below the grate. The CO₂ meter, made by the Brown Instrument Co. of Philadelphia, shows the percentage of CO₂ in the flue gas at all times and records same on a time chart.

The ash handling equipment consists of the shaker mechanism shown in Fig. 17 and the ash car, ash track, and ash tunnel. The picture of the shaker mechanism was taken from the ash pit looking upwards. Figure 18 shows the ash track and tunnel.

PLANT EFFICIENCY

There is no meter or gage in the plant to measure the total amount of steam generated over a given period, the only steam meter in the plant being used solely for measuring the amount of steam which is sold to the dairy. However the data obtained by measuring the amount of water used and the amount of coal burned enables us to obtain a rough idea of the plant efficiency. The following data

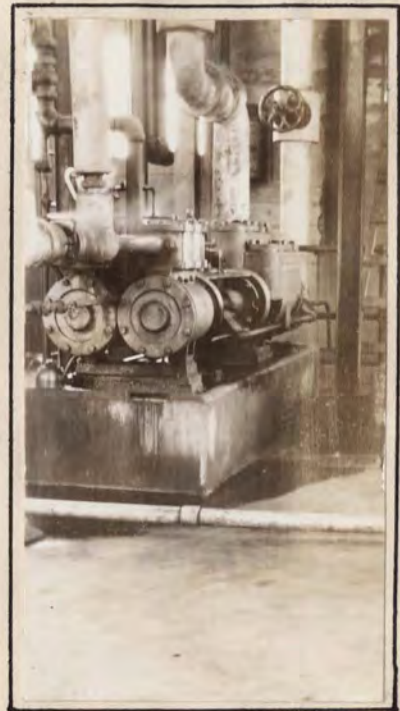


Fig. 15. Boiler Feed Pump.

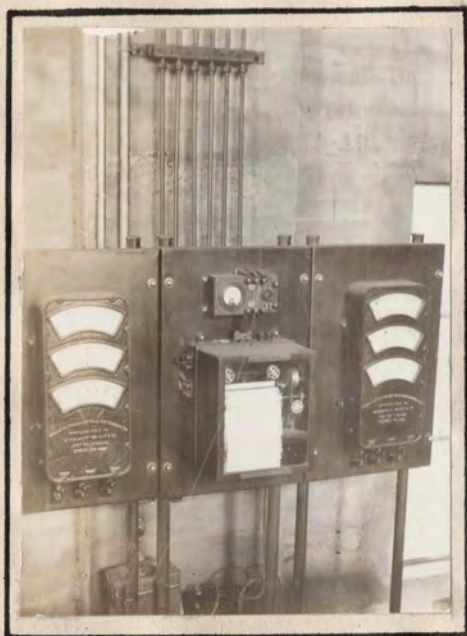


Fig. 16. Brown CO₂ Meter,
and Draft Gages.



Fig. 18. Ash Tunnel.



Fig. 17. Grate Shaker As Viewed From Ash Pit.

obtained from the Office of the Superintendent of Grounds gives the monthly average of pounds of water used per pound of coal from July 1932 to June 1933.

Month.	lb. water/lb.coal.
July	11.5
August	12.9
Sept.	12.0
Oct.	10.2
Nov.	9.9
Dec.	10.0
Jan.	9.6
Feb.	9.7
Mar.	10.0
April	10.4
May	11.2
June	12.1

A brief inspection of the above data apparently shows a higher water rate of evaporation during the summer months when the plant is operating at only a fraction of full capacity, than during the winter months when the plant is operating at nearly full capacity. However, during the summer months one of the other of the two boilers is idle nearly all the time. During this idle period large quantities of warm water are used to flush and clean the boiler, thus giving an erroneous evaporation rate. The true evaporation rate is probably that given for the mid winter months such as November, December or January. This would give us a water rate of evaporation of about 9.8 pounds of steam per pound of coal, which is considered very good for this size and type of plant.



View of Roof Truss Construction
as Seen From Position on
Feed Water Heater Platform.



Interior View of
Fire Box.

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Others,

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